Heiner Fangerau: Spinning the Scientific Web. Jacques Loeb (1859-1924) und sein Programm einer internationalen biomedizinischen Grundlagenforschung

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Spinning the Scientific Web: Jacques Loeb (1859—1924) und sein Programm einer internationalen biomedizinischen Grundlagenforschung by Heiner Fangerau
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gathered information have any relevance for society as a whole and, if so, what is it?

We also read about the soul-searching undertaken by institutions of higher education seeking to address this dilemma: Should they serve science itself, through the accumulation of "pure" knowledge, or society, by producing responsible, well-educated citizens? Generally, there are two developments: universities moving away from "pure" research and toward applied science; and technical and agrarian schools trying to gain stature by developing independent research programs.

Synthetisch denken ("synthetic thought") is also very much a book about idealism and idealist belief systems expressing themselves. Once we leave the safe haven of scientific labor and enter into discussions about its—real and desired—effects on the direction of society, the story also becomes a political one. In the midst of this, Baneke is a sympathetic but cautious reporter who, despite showing sympathy for his protagonists, remains at a safe distance. What he points out very well is the way in which these esteemed professionals are regarded as mere dilettantes once they engage in political discussion and how much trouble they have in adapting to that change in status.

With this volume, David Baneke has given us a genuinely new view of the social role of science and scientists, within and outside their disciplines, in the early twentieth century. It is a particularly useful study because it breaks away from the usual topical approach and treats scientists as active and ambitious members of society.

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Heiner Fangerau. *Spinning the Scientific Web: Jacques Loeb (1859–1924) und sein Programm einer internationalen biomedizinischen Grundlagenforschung*. 280 pp., illus., tables, bibl., index. Berlin: Akademie Verlag, 2010. €59.80 (cloth).

At the outset of the twentieth century, the German-American physiologist Jacques Loeb was a world-renowned leader in biology, noted mainly for his work on reproduction without fertilization, on plant and animal tropism, and on the behavior of colloids. His conviction that phenomena of life can be explained in terms of physical and chemical laws, as well as his determination to engineer nature, has been well explored. Equally, historians of science have described his social activism, his philosophical principles, and his impact on the public. What has been missing from the picture so far is consideration of how Loeb developed and internationally disseminated his program of a "technical biology" as a basis of modern biomedical research. This gap is now filled, thanks to *Spinning the Scientific Web*, the new book by Heiner Fangerau (University of Ulm).

Methodologically, the study relies on the epistemological concepts outlined by the historian of science Ludwik Fleck, namely "thought style" and "thought collective." It is with these generative structures in mind that Fangerau analyzes the formation of Loeb's scientific program and his efforts to transfer his ideas to different scientific networks and contexts. Somewhat unusual for this kind of approach is the integration of complex quantitative techniques and visualizations to depict the structure of the thought collectives involved.

The book consists of three parts. Part 1 reconstructs Loeb's thought- and work-style. Inspired by Ernst Mach's positivism and Josef Popper's technological ideal and influenced by the experimental methods developed at the Naples Zoological Station, Loeb's studies focused on understanding complex physiological processes as physical and chemical phenomena and, subsequently, on manipulating and technically controlling these life phenomena. As Fangerau shows, Loeb's emigration to the United States in 1891 was crucial for merging his "German style" of physiology with biological interests. At Woods Hole, at Berkeley, and at the Rockefeller Institute in New York Loeb encountered institutional infrastructures that were ideal for allowing him to develop his "technical biology," most famously reflected in his studies on artificial parthenogenesis and the hybridization of sea urchin eggs. World War I was decisive for intensifying Loeb's aim to propagate his ideas in Europe, while at the same time his view of German scientists became more negative. Fangerau convincingly demonstrates how Loeb struggled against the antimechanistic trends in German colloid chemistry and actively tried to implement his approach in Europe. For these purposes he gave financial support to liberal-oriented individuals and scientists who conducted research in his "style," advocated the renewal of international scientific connections, and vigorously promoted the dissemination of his work by sending copies of his monographs and his "journal of general physiology" to scientific institutions.

In Part 2 Fangerau traces the formation and transformation of the thought collective Loeb depended on for the development and promotion of his program. He analyzes the formal network rep-

resented by citations in Loeb's scientific articles and the informal network represented by entries in his correspondence, employing quantitative methods (co-citation analysis, social network analysis) and visualization programs prevalent in sociology and information sciences. The extensive technical explanations will challenge readers unfamiliar with terms such as "pathfinder network algorithms" and "co-citation coefficients." In fact, the additional benefit of the analysis seems limited, at least with respect to Loeb's "citation identity." The citations of authors merely reflect intellectual influences and the shifts in Loeb's research topics from irritability, regenerative growth, and reproductive development to the colloidal behavior of proteins. This, however, is stated at the beginning of the book when Fangerau qualitatively explores Loeb's publications. More instructive is the analysis of his correspondence, which shows that Loeb's social network remained comparatively stable and accounts for core individuals who propagated his ideas. The German physiologist Nathan Zuntz, for example, acted as an apologist for Loeb's developmental physiology and as a mediator between physiologists, chemists, and medical scientists. Vital for the question of how Loeb managed to spin a broad scientific web is the last, regrettably short, chapter of Part 2. In which publications and scientific fields did Loeb try to disseminate his work? Fangerau demonstrates that Loeb deliberately chose specific scientific organs for his publications and in the end succeeded in getting reviewed in purely medical journals—a process reinforced by his affiliation with the Rockefeller Institute.

The last part of the book centers on esoteric and exoteric perceptions. Fangerau specifies the recognition Loeb obtained through various nominations for the Nobel Prize. He describes his characterization in the best-selling novel *Arrowsmith* and covers the public reaction to the parthenogenesis and hybridization experiments that established his standing as the seminal figure of reductionist biomedicine.

Fangerau's prose is influenced by the German tradition of scientific writing and is at times overly precise and not as captivating as one might wish. This, however, is a negligible shortcoming—as is the lack of balance among the sections in Part 2. *Spinning the Scientific Web* is based on a huge number of sources, skillfully combines different methodological approaches, and, most notably, captures Loeb in a new and very important light: as a catalyst of transatlantic knowledge transfers and passages that established an international biomedical research program that has essentially survived into the present.

SILVIA BERGER

Gabriel Galvez-Behar. *La république des inventeurs: Propriété et organisation de l'innovation en France (1791–1922).* 352 pp., app., illus., tables, bibl., index. Rennes: Presses Universitaires de Rennes, 2008. €19 (paper).

Innovation has become a subject of great interest. Its development is usually accompanied by an increasing emphasis on the rights of intellectual property and strong debates about them. The aim of *La république des inventeurs* is to provide historical background and perspective on the most recent and controversial problems, related either to patenting living material or software or to copyright and forgery. Gabriel Galvez-Behar here proposes an analysis of the relationship between technological innovation and industrial property in modern France. Thus he fills a historiographical gap between treatments of the French case and the American and British ones, which have been far more abundantly studied.

France was one of the first nations to set up modern legislation on patents—as early as 7 January 1791, during the French Revolution. The book starts with this major rupture in the French patent system. It ends with December 1922, when the collective invention was institutionalized by transformation of the wartime state organization into a peacetime one, the National Office for Scientific and Industrial Researches and Inventions (Office National des Recherches Scientifiques et Industrielles et des Inventions [ONRSII]). Meanwhile, a new rupture occurred in 1844. Since 1791, patents had been based on natural law and on an inviolable and sacred right to property, although they were very expensive to obtain; no preliminary examination had been required—even though an unofficial examination system had been set up by a ministerial service, the Consultative Board of Arts and Manufactures (Bureau Consultatif des Arts et Manufactures). Although based on more restrictive principles, the 1844 law instituted a cheaper, and thus more democratic, patent system, which was at first used mainly by artisans rather than the inventors involved in the first wave of industrialization. At the same time, Britain and other countries reformed or set up their patent legislation; international consistency was sought through hard struggles in international congresses on patents, organized on the occasion of the world's fairs from the time of the Vienna fair (1873) onward. After the 1878 congress in Paris, the "Union of Paris" extended rights to the citizens of the eleven countries who had signed the convention. But without the participation of Germany, Britain,